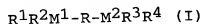


WE CLAIM:

1. A process for producing primary alcohols from secondary alcohols and/or tertiary alcohols and/or ketones, wherein the process comprises reacting a compound selected from a secondary alcohol, a tertiary alcohol, a ketone, or mixtures thereof, with carbon monoxide and hydrogen in the presence of a catalyst which is comprised of:

(i) a source of Group VIII metal,

(ii) a bidentate ligand having the general formula (I):



wherein  $M^1$  and  $M^2$  are independently P, As or Sb;

$R^1$  and  $R^2$  together represent a bivalent substituted or unsubstituted cyclic aliphatic group whereby the two free valencies are linked to  $M^1$ ;  $R^3$  and  $R^4$  independently represent a substituted or unsubstituted hydrocarbyl group, or together represent a bivalent or unsubstituted cyclic group whereby the two free valencies are linked to  $M^2$ ;

and R represents a bivalent organic bridging group; and

(iii) an acid having a  $pK_a$  of 3 or less, wherein the acid is in stoichiometric excess to the Group VIII metal.

2. The process of Claim 1 wherein the acid has a  $pK_a$  of 2.5 or less.

3. The process of Claim 2 wherein the acid has a  $pK_a$  of 2 or less.

4. The process of Claim 1 wherein the acid is selected from the group consisting of phosphoric acid, sulphuric acid, sulphonic acids, phosphonic acid, halogenated phosphonic acids, carboxylic acids, halogenated

carboxylic acids, aromatic carboxylic acids, and mixtures thereof.

5. The process of Claim 4 wherein the acid is a sulphonic acid.

6. The process of Claim 5 wherein the acid is selected from the group consisting of methanesulphonic acid, trifluoromethanesulphonic acid, tert-butan sulphonic acid, p-toluenesulphonic acid and 2,4,6-trimethylbenzenesulphonic acid.

7. The process of Claim 1 wherein the acid is a mixture of methane sulphonic acid and phosphoric acid.

8. The process of Claim 1 wherein the Group VIII metal is selected from the group consisting of rhodium, nickel, palladium, and platinum.

9. The process of Claim 8 wherein the Group VIII metal is selected from the group consisting of palladium and platinum.

10. The process of Claim 9 wherein the Group VIII metal is palladium.

11. The process of Claim 1 wherein both  $M^1$  and  $M^2$  are phosphorus atoms.

12. The process of Claim 1 wherein R is an aliphatic bridging group containing from 1 to 10 carbon atoms.

13. The process of Claim 12 wherein R is an aliphatic bridging group containing from 2 to 6 carbon atoms.

14. The process of Claim 13 wherein R is an aliphatic bridging group containing from 2 to 4 carbon atoms.

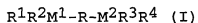
15. The process of Claim 1 wherein the bivalent cyclic aliphatic groups represented by  $R^1$  and  $R^2$  and/or  $R^3$  and  $R^4$ , respectively, contain from 6 to 9 ring atoms, of which one ring atom is  $M^1$  and  $M^2$ , respectively.

16. The process of Claim 15 wherein  $R^1$  and  $R^2$  together and  $R^3$  and  $R^4$  together are each a bivalent cycloaliphatic group.

17. The process of Claim 1 wherein the cycloaliphatic group contains at least 5 ring atoms.
18. The process of Claim 17 wherein the cycloaliphatic group contains 6 to 20 ring atoms.
19. The process of Claim 1 wherein  $M^1$  and  $M^2$  are both phosphorus and  $R^1$ ,  $R^2$  and  $M^1$  together and  $R^3$ ,  $R^4$  and  $M^2$  together both represent a phosphabicycloalkyl group.
20. The process of Claim 1 wherein the bivalent cycloaliphatic group is selected from the group consisting of 1,4-cyclo-octylene, 1,5-cyclo-octylene, and mixtures thereof.
21. The process of Claim 1 wherein the quantity of catalyst used is from about  $10^{-8}$  to about  $10^{-1}$  mole atom of Group VIII metal used per mole of the compound reacted.
22. The process of Claim 21 wherein the quantity of catalyst used is from about  $10^{-7}$  to about  $10^{-2}$  mole atom of Group VIII metal used per mole of the compound reacted.
23. The process of Claim 1 wherein from about 0.5 to about 10 moles of bidentate ligand are used per mole atom of Group VIII metal.
24. The process of Claim 23 wherein from about 1 to about 6 moles of bidentate ligand are used per mole atom of Group VIII metal.
25. A process for converting paraffins to primary alcohols comprising the steps of:
  - (a) subjecting a paraffin feed comprising linear and/or branched paraffins to an oxidation reaction in the presence of an oxidation catalyst to form a mixture comprising secondary alcohols and/or tertiary alcohols and/or ketones; and;
  - (b) reacting the mixture of secondary alcohols and/or tertiary alcohols and/or ketones with carbon

monoxide and hydrogen in the presence of a catalyst based on:

- (i) a source of Group VIII metal,
- (ii) a bidentate ligand having the general formula (I):



wherein  $M^1, M^2, R^1, R^2, R^3, R^4$  and R are as defined hereinabove; and

- (iii) an acid having a  $pK_a$  of 3 or less wherein the acid is in stoichiometric excess over the Group VIII metal.